



*U.S. Department of Energy*

*National Energy Technology Laboratory*



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Dear Colleague:

*Turbine Power Systems – The Pathway to a New Era of Clean, Efficient, and Reliable Coal Technologies*

We would like to invite you to our conference on Turbine Power Systems for Clean Coal Technologies. The conference will provide a forum for discussion and updates on the DOE Office of Fossil Energy High Efficiency Engines and Turbines (HEET) Program.

The gas turbine has evolved into a workhorse in the Power and Petrochemical Industry. The Gas Turbine in the Power Industry has become the premier electric generation system for peak, intermediate and combined-cycle baseload applications. In the Petrochemical Industry, it has been the major Prime Mover for Off-shore Platforms, Pipelines and for many refinery and petrochemical processes. They are used widely in Co-Generation Systems in all major industries. Gas turbines are compact, lightweight, easy to operate, and come in sizes ranging from several hundred kilowatts to hundreds of megawatts.

A gas turbine produces a high-temperature, high-pressure gas working fluid through combustion to induce shaft rotation by impingement of the gas on a series of specially designed blades. The shaft rotation drives an electric generator, or large gas compressors and a compressor, for the air used by the gas turbine. Many turbines also use a heat exchanger called a recuperator to impart turbine exhaust heat into the combustor's air/fuel mixture.

The transition to gas turbines for new central station power production will provide enormous benefits to the nation. Current estimates call for more than 90% of all new power plants built in the United States over the next 20 years to be powered by steam and gas turbines. As many as 70% of these plants are expected to utilize technologies developed under the Department of Energy Advanced Turbine Systems Program. As a result, a rapidly growing share of our nation's electric power will be generated by clean-burning, domestically produced natural gas and coal. The nation's Petrochemical and Pipeline Industry has been a large user of gas turbines for many years and these high-efficiency turbines will aid in increasing plant efficiency.

In response to the DOE Clean Coal Power Initiative, the National Energy Technology Laboratory (NETL) is supporting the HEET program. The HEET program will result in the development and commercialization of advanced turbine technologies for coal power systems with near-zero environmental emissions, while maintaining low production costs. Under HEET, advanced industrial turbine and hybrid power modules will be developed, tested, and ultimately made commercially viable through the President's Clean Coal Power Initiative.

The HEET Program supports the development of ultra-high efficiency, zero emissions, turbine-based power plants. Under the program, power modules based on simple/combined cycles and hybrids will be developed and tested. A primary element of the program is to develop technology for the utilization of syngas derived from coal as a fuel feedstock. This will enable these power modules to be integrated with gasifiers or other coal-based fuel supply systems.

The new turbines are to be more efficient and must have high availability and reliability. This requires great emphasis on the development of Condition Monitoring Systems. DOE is dedicated to improving availability and reliability by over 15%. Degradation is a very important parameter and must be closely examined to maintain high performance.

"Hybrid Power System" designs combine two or more power generating technologies into an integrated power generation system. These systems have the potential for merging the best aspects of different power technologies into one system that achieves fuel efficiency and emissions performance beyond the reach of any single stand-alone system. NETL is supporting the development of small hybrid power systems to investigate issues for integration of a fuel cell

with a turbine. Micro-turbines are currently being combined with solid oxide and molten carbonate fuel cells as a stepping stone towards the development of larger, coal-fueled hybrid power plants. HEET is also supporting the development of larger and more powerful mid-term hybrid systems (up to 20 megawatts) with even greater fuel efficiencies (at least 70%). To achieve demonstration of these systems by 2010, we are initially focusing on concepts that combine existing components. Our goal is to produce hybrid systems that will be capable of generating electricity at costs 10 to 20% below that of today's best available technology.

In the long-term, the NETL is committed to enabling the production of affordable hybrid systems with efficiencies in excess of 80% to support natural gas and coal-fired central power plant applications.

Industrial gas turbines are a critical component to advanced coal-based power systems. In integrated gasification combined-cycle (IGCC) systems, the clean syngas remaining (after pollutant separation) is used, in whole or in part, to fuel a combustion turbine. The combustion turbine drives an electric generator, provides air under pressure to the gasifier or air separation unit for oxygen production, and produces heat (exhaust) to generate steam for steam turbine electric power. This combined use of combustion and steam turbines significantly boosts generation efficiency. When HEET power modules are integrated with an advanced gasifier and/or air separation unit, the Clean Coal Power Initiative goal of 60% (HHV) coal-fired power plants can be achieved.

#### Purpose of the Turbine Power Systems Conference and Condition Monitoring Workshop

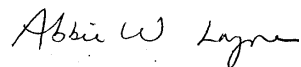
- Review the mission, goals, objectives, strategy, program portfolio, and objectives of the HEET program
- Learn more about strategic efforts for advanced turbine-based power generation systems underway at DOE and in the regional, state, and local governments, national laboratories, and other research organizations
- Discuss the technical issues and R&D needs for advancing turbine-based power systems and the regulatory trends related to their commercial deployment
- Discuss new techniques in Condition Monitoring to improve reliability, availability, and maintainability of Turbomachinery
- Discuss R&D roadmaps to develop programs for increasing turbine life and to define and identify problems before they reduce the availability and reliability of the Turbine Power Module.
- Discuss Insurance Companies' views of these advanced Gas Turbines for both equipment and business interruption insurance.
- Interface and exchange ideas with the leading global experts in turbine engine and Condition Monitoring technologies

#### Who Should Attend

- Power industry equipment manufacturers, researchers, and service providers
- Petrochemical Users and Manufacturers
- Cogenerators
- Federal and State Regulators
- Energy associations and consumer groups involved in electricity, and petrochemical policy and technology development.

We look forward to your attendance and participation towards a successful conference and workshop.

Sincerely,



Abbie Layne  
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